



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/661,982

09/12/2003

Cary Lee Bates

ROC920000051.D1

9327

46797

7590

08/20/2008

IBM CORPORATION, INTELLECTUAL PROPERTY LAW
DEPT 917, BLDG. 006-1
3605 HIGHWAY 52 NORTH
ROCHESTER, MN 55901-7829

EXAMINER

WANG, BEN C

ART UNIT

PAPER NUMBER

2192

MAIL DATE

DELIVERY MODE

08/20/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/661,982	BATES ET AL.	
	Examiner	Art Unit	
	BEN C. WANG	2192	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 May 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's amendment dated May 22, 2008, responding to the Office action mailed March 27, 2008 provided in the rejection of claims 1-22, wherein claims 14-22 have been cancelled.

Claims 1-13 remain pending in the application and which have been fully considered by the examiner.

Applicant's arguments with respect to claims currently amended have been fully considered but are moot in view of the new grounds of rejection – see *Spertus et al.* and *Kolawa et al.* - arts made of record, as applied hereto.

Claim Rejections – 35 USC § 102(e)

The following is quotation of 35 U.S.C. 102(e) which form the basis for all obviousness rejections set forth in this office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-8 and 11-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Spertus et al. (Pat. No. 6,938,245 B1) (hereinafter 'Spertus' - art made of record)

Art Unit: 2192

3. **As to claim 1** (Currently Amended), Spertus discloses a computer-implemented method for managing memory available for dynamic allocation during execution of code containing a plurality of memory allocators and a plurality of memory deallocators, comprising:

- Providing a computer user interface (e.g., Fig. 1, elements 111(a) – UI Client; 125 – User Input; 127 – Formatted Output; Fig. 2, element 251 – CLI Client; Figs. 4-8; Col. 2, Lines 33-37 - ... the interactive interface can be used not only with debug information from a current execution of the program ...);
- allowing a user to establish, via the computer user interface, a relationship between one or more of the memory deallocators and one or more of the memory allocators, wherein the relationship requires that memory space allocated by the one or more allocators is freed by the one or more deallocators (e.g., Fig. 9; Col. 15, Lines 20-42 – Fig. 9 shows the structure of a bucket 901. Each bucket 901 is made up of a page information structure 907 which includes information 904 indicating the size of the objects that will be allocated from the bucket and a free list pointer 906 indicating the head of the list of unallocated object 911 contained in bucket 901 ...);
- allowing the code to execute; upon a call to the one or more deallocators to free a memory space, determining whether the relationship is violated (e.g., Fig. 8, element 811 – *gcLogAllLeaks* - ... write all leaks to the log; Col. 2, Lines 59-62 - ... provides memory debugging information such as memory allocations,

memory leaks, and current heap size; Col. 5, Lines 51-67 - ... One problem detected by a memory debugger is memory 'leaks' ...); and

- if so, notifying the user (e.g., Fig. 1; Col. 5, Lines 48-52 – Debugger client 101 and the user interface clients 111 further communicate with each other by means of control channel 121, which may be any arrangement which permits transfer of messages between debugger client 102 and a user interface client 111)

4. **As to claim 2** (Original) (incorporating the rejection in claim 1), Spertus discloses the method wherein notifying the user comprises halting execution of the code (e.g., Col. 4, Lines 56-65 - ... may instruct the debugger to stop execution of program ...)

5. **As to claim 3** (Original) (incorporating the rejection in claim 1), Spertus discloses the method wherein notifying the user comprises halting execution of the code and displaying a status message to the user (e.g., Col. 4, Lines 56-65 - ... may instruct the debugger to stop execution of program ...; Fig. 1; Col. 5, Lines 48-52 – Debugger client 101 and the user interface clients 111 further communicate with each other by means of control channel 121, which may be any arrangement which permits transfer of messages between debugger client 102 and a user interface client 111)

6. **As to claim 4** (Original) (incorporating the rejection in claim 1), Spertus discloses the method if the relationship is not violated, freeing the memory space (e.g., Fig. 8, element 805 – *gcEnableFree* - ... cause explicit calls to free() and delete to reclaim memory; Fig. 10; Col. 6, Lines 7-10 - ... automatic memory management by

Art Unit: 2192

periodically collecting garbage, that is, memory which was once allocated but is not longer being used by the program, and freeing the garbage memory for reuse)

7. **As to claim 5** (Original) (Original) (incorporating the rejection in claim 1), Spertus discloses the method wherein determining whether the relationship is violated comprises determining that the memory space was allocated by an allocator different from the one or more memory allocators (e.g., Fig. 8, element 811 – *gcLogAllLeaks* - ... write all leaks to the log; Col. 2, Lines 59-62 - ... provides memory debugging information such as memory allocations, **memory leaks**, and current heap size; Col. 5, Lines 51-67 - ... One problem detected by a memory debugger is memory 'leaks' ...)

8. **As to claim 6** (Currently Amended), Spertus discloses a computer-implemented method for managing memory available for dynamic allocation during execution of code containing a plurality of memory allocators and a plurality of memory deallocators, comprising:

- establishing a relationship between a user-selected memory deallocator and a user-selected memory allocator, wherein the relationship requires that memory space freed by the user-selected deallocator have been allocated by the user-selected allocator (e.g., Fig. 9; Col. 15, Lines 20-42 – Fig. 9 shows the structure of a bucket 901. Each bucket 901 is made up of **a page information structure** 907 which includes information 904 **indicating the size of the objects that will be**

allocated from the bucket and **a free list pointer 906 indicating the head of the list of unallocated object** 911 contained in bucket 901 ...);

- allowing the code to execute (e.g., Col. 1, Lines 17-18 – Debuggers are tools used by programmers to determine what is going on when a program is executed);
- upon a call to the user-selected deallocator to free a memory space, determining whether the memory space was allocated by the user-selected allocator (e.g., Fig. 8, element 811 – *gcLogAllLeaks* - ... write all leaks to the log; Col. 2, Lines 59-62 - ... provides memory debugging information such as memory allocations, **memory leaks**, and current heap size; Col. 5, Lines 51-67 - ... One problem detected by a memory debugger is memory ‘leaks’ ...); and
- if so, notifying the user that the relationship is violated (e.g., Fig. 1; Col. 5, Lines 48-52 – Debugger client 101 and the user interface clients 111 further communicate with each other by means of control channel 121, which may be any arrangement which permits transfer of messages between debugger client 102 and a user interface client 111)

9. **As to claim 7** (Original) (incorporating the rejection in claim 6), please refer to claim **3** as set forth above accordingly.

10. **As to claim 8** (Original), Spertus discloses a method for managing memory available for dynamic allocation during execution of code containing a plurality of memory allocators and a plurality of memory deallocators, comprising:

Art Unit: 2192

- setting an upper limit on the amount of memory space an allocator can allocate during execution of the code, wherein the upper limit is specific to the allocator (e.g., Col. 17, Lines 15-25 - At initialization time, the allocator creates arena 0116 by mapping a large sequence of logical pages 905. This mapping operation reserves the virtual address space acquired for the logical pages);
- during execution of the code, tracking the amount of memory space allocated by the allocator (e.g., Col. 17, Lines 26-46 - ... During a request for allocation of a large object ... Finally, the allocation request is satisfied ...); and
- when the amount of memory space allocated exceeds the limit, notifying a user (e.g., Fig. 1; Col. 5, Lines 48-52 – Debugger client 101 and the user interface clients 111 further communicate with each other by means of control channel 121, which may be any arrangement which permits transfer of messages between debugger client 102 and a user interface client 111)

11. **As to claim 11** (Original) (incorporating the rejection in claim 8), please refer to claim 7 as set forth above accordingly.

12. **As to claim 12** (Original) (incorporating the rejection in claim 8, Spertus discloses wherein the upper limit is independent of other memory size limitations (e.g., Fig. 9; Col. 15, Lines 20-42 – Fig. 9 shows the structure of a bucket 901. Each bucket 901 is made up of a page information structure 907 which includes information 904 indicating the size of the objects that will be allocated from the bucket and a free list

Art Unit: 2192

pointer 906 indicating the head of the list of unallocated object 911 contained in bucket 901 ...)

13. **As to claim 13** (Original) (incorporating the rejection in claim 8), Spertus discloses wherein the upper limit is not a limit on a stack size (e.g., Col. 17, Lines 44-46 - ... If the number of consecutive uncommitted pages in arena 1006 is not enough, another large group of uncommitted memory is mapped and added to arena 1006)

Claim Rejections – 35 USC § 103(a)

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spertus in view of Kolawa et al. (Pat. No. 5,842,019) (hereinafter 'Kolawa' - art made of record)

15. **As to claim 9** (Original) (incorporating the rejection in claim 8), Spertus discloses a debugger which may be easily adapted to a number of different kinds of user interfaces, including the user interface provided by Web browsers and that works as well to analyze information about past executions of a program as it does to analyze

Art Unit: 2192

information about a current execution (e.g., Col. 2, Lines 11-19) but does not explicitly disclose the step of tracking comprises:

- determining whether the allocator is called to allocate memory and, if so, incrementing a counter; and
- determining whether a deallocator is called to deallocate memory allocated by the allocator and, if so, decrementing the counter.

However, in an analogous art of *Method and System for Dynamically Detecting Leaked Memory Space in a Computer Program*, Kolawa discloses the step of tracking comprises:

- determining whether the allocator is called to allocate memory and, if so, incrementing a counter (e.g., Fig. 8, blocks 80 – NEW BLOCK?; 81 – INCREMENT REFERENCE COUNT; Col. 6, Lines 1-7 - ... points to a newly allocated memory block (block 80), the reference count is incremented by one (block 81) ...); and
- determining whether a deallocator is called to deallocate memory allocated by the allocator and, if so, decrementing the counter (e.g., Fig. 8, blocks 82 – OLD BLOCK?; 83 – DECREMENT REFERENCE COUNT; Col. 6, Lines 1-7 - ... if a new value has been assigned to the pointer variable, thereby eliminating the reference to the old memory block (block 82), the reference count is decremented by one (block 83) ...)

Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made to combine the teachings of Kolawa into the Spertus' system to further provide the followings in the Spertus system:

- determining whether the allocator is called to allocate memory and, if so, incrementing a counter; and
- determining whether a deallocator is called to deallocate memory allocated by the allocator and, if so, decrementing the counter.

The motivation is that it would further enhance the Spertus' system by taking, advancing and/or incorporating the Kolawa's system which offers significant advantages of an approach to detecting leaked memory space in a computer program by employing a combination of runtime, dynamic memory searching and post-execution memory sweeping as once suggested by Kolawa (e.g., Col. 1, Lines 41-46)

16. **As to claim 10** (Original) (incorporating the rejection in claim 8), Kolawa discloses the step of tracking comprises incrementing a counter in the event of memory allocation by the allocator (e.g., Fig. 8, blocks 80 – NEW BLOCK?; 81 – INCREMENT REFERENCE COUNT; Col. 6, Lines 1-7 - ... points to a newly allocated memory block (block 80), the reference count is incremented by one (block 81) ...) and decrementing the counter in the event of memory deallocation of memory space allocated by the allocator (e.g., Fig. 8, blocks 82 – OLD BLOCK?; 83 – DECREMENT REFERENCE COUNT; Col. 6, Lines 1-7 - ... if a new value has been assigned to the pointer variable,

Art Unit: 2192

thereby eliminating the reference to the old memory block (block 82), the reference count is decremented by one (block 83) ...)

Conclusion

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben C. Wang whose telephone number is 571-270-1240. The examiner can normally be reached on Monday - Friday, 8:00 a.m. - 5:00 p.m., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on 571-272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ben C Wang/
Examiner, Art Unit 2192

/Eric B. Kiss/
Eric B. Kiss
Primary Examiner, Art Unit 2192

August 14, 2008